

MATH 2200
QUIZ 10

Name: _____ Key _____

Problem: Let $f(x) = 10(x - 1)e^{-2x}$.

(a) (5 points) Find $f'(x)$ and $f''(x)$.

Solution: Using the Product Rule,

$$f'(x) = 10e^{-2x} + 10(x - 1)(-2)e^{-2x} = 10(1 + (x - 1)(-2))e^{-2x} = 10(3 - 2x)e^{-2x}$$

$$f''(x) = 10(-2)e^{-2x} + 10(3 - 2x)(-2)e^{-2x} = 10(-2 + (3 - 2x)(-2))e^{-2x} = 10(4x - 8)e^{-2x}$$

(b) (5 points) Find the critical points and inflection points of f . Use the *Second Derivative Test* (not the First Derivative Test!) to decide whether the critical points you get are local maxes or mins.

Solution: Setting $f'(x) = 0$ and remembering that e^{-2x} is never 0, we get $3 - 2x = 0$, so $x = 3/2$ is the one and only critical point. Setting $f''(x) = 0$ and remembering that e^{-2x} is never 0, we get $4x - 8 = 0$, so $x = 2$ is the only potential inflection point, and indeed it is an inflection point since $f''(1)$ is negative and $f''(3)$ is positive. Since $f''(3/2)$ is negative, it follows by the Second Derivative Test that $3/2$ is a local max. (I think zero people said this last sentence; it might be a good idea to look up what the Second Derivative Test says!)